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### National Plan for Expansion of Grain Production Capacity

#### Report Categories:

Agricultural Situation

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#### Report Highlights:

In November 2009, the National Development and Reform Commission (NDRC) released the “National Plan for Expansion of Grain Production Capacity by 50 billion kilograms (50 million MT) during 2009-2020.” This plan includes a background on grain production in China, the current issues Chinese grain farmers face, grain supply and demand issues, plans to improve yield measures and mechanized technology for farm use, and other guidelines and principles to be followed in the coming years. This report contains an UNOFFICIAL translation.

#### Executive Summary:

China’s grain production has averaged above 500 million metric tons (MT, or 500 billion kilograms) annually from 2007-2009. Feeding a population of more than 1.3 billion tops the Government of China’s (GOC) agenda. Historically, the GOC has not viewed international grain trade as a reliable and secure source to make up for domestic grain shortages, citing international price fluctuation, tight global supplies, and grains-based biofuel development. To meet this goal of near self-sufficiency in grain production over

the coming years, China's production must increase to meet the demands of its growing population and consumption. However, numerous constraints such as accelerated industrialization and urbanization, comparatively low returns from grain production, migration of the agricultural labor force, and unpredictable weather along with a worsening ecological environment are all concerns that remain to be tackled by the GOC while it strives to increase grain acreage and raise yields. China's definition of grains includes cereals (paddy, corn, wheat, sorghum, and barley), tubers (potato), and pulses.

For yield improvement, the plan outlines technical approaches to improve yields for paddy, wheat, corn, and soybeans in the coming 12 years. According to the plan, grain yields must increase by 0.9 percent annually to meet the target of an increase of 50 million MT in production capacity, which is deemed a feasible objective by the GOC. In addition to conventional seed breeding, research and development of transgenic seed such as corn and soybean is also included in the plan.

The plan reiterates the long standing state policy of 95 percent self-sufficiency in domestic grain production and focuses on raising the overall capacity of grain production to assure China's grain security.

Begin Translation:

## **National Plan for Expansion of Grain Production Capacity by 50 Billions Kilograms (2009-2020)**

### **Foreword**

Grain is a crucial commodity that has immediate effects on the national economy and people's livelihood, underpinning economic growth, social stability, and national independence. Safeguarding grain security is always the paramount concern for national governance and security. With an expanding population, China's grain consumption has inevitably increased, and constraints such as accelerated urbanization and industrialization, water and soil resources, and climate changes add to difficulties in sustained growth of grain output. Biofuel development, growing grain consumption worldwide, tight grain supply in international markets, and increased volatility of grain prices result in an increasingly smaller chance of regulating supply and demand through international markets. Therefore, it is imperative to stick to the principle of basically achieving grain self-sufficiency domestically, and focus on raising the overall capacity of grain production to assure China's grain security.

According to the National Framework for Medium-to-Long-Term Grain security (2008-2020) (hereinafter the "Framework"), the national grain consumption will reach 572.5 billion kg by 2020. With a grain self-sufficiency rate maintained at 95 percent, the national grain output should arrive at 545 billion kg, 45 billion kg beyond the existing grain production capacity [1]. Taking into account numerous uncertainties that affect grain production and effective supply and maintaining the principles of increasing the overall capacity of grain production, ensuring supply and reserving an acceptable safety margin, an additional

production capacity of 50 billion kg is required in the coming 12 years to provide a stronger assurance for China's grain security.

For the purpose of this Plan, the "grain production capacity" refers to the capacity of delivering a certain grain output in a relatively stable way, which is determined by resources, economic and technological conditions, and formed by aggregate input of various production factors.

Spanning 2009 through 2020, this Plan addresses three major crops that include paddy, wheat and corn, and soybean is also included. It also provides overall planning nationwide on core production zones, major grain production counties in secondary production areas, reserve zones, and other zones for grain production.

## **I. Status Quo of China's Grain Production**

Since the founding of the People's Republic of China, the Party and the government have attached great importance to grain production by introducing a series of policies and measures to expand rural reforms, strengthen development of agricultural infrastructures, accelerate promotion of new technologies, encourage farmers to produce grain, and focus on increasing the grain production capacity. The grain output rose from 113.2 billion kg in 1949 to 501.6 billion kg in 2007, representing a historic leap from long-term shortage to a basic balance between demand and supply. That expansion has successfully addressed the issues of feeding over 1 billion people, laying a solid foundation for eco-social development of China and making great contribution to the global grain security.

### **(I) Overview of Grain Production since the Birth of New China**

Looking back, we can divide the new China's grain production into two stages: the stage of rapid growth from a small base in the first 28 years (1949-1977) and the stage of increased development from a large base in the 30 years after China's opening up and reform.

#### **1. From the birth of new China to 1977.**

In this period, the grain growing area increased from 1.65 billion Mu (1 Mu = 1/15 hectare) to 1.81 billion Mu in 1977, with the total output successively breaking the marks of 150 billion kg, 200 billion kg and 250 billion kg. The grain yield per Mu rose from 69 kg to 157 kg, representing a 127 percent increase. Infrastructures and technologies have advanced over years. Effective irrigation area expanded from 299 million Mu in 1952 to 675 million Mu in 1977, up 126 percent; major breakthroughs were made in development of new varieties, including the hybrid paddy. Input of modern production factors increased. Chemical fertilizer use (in pure basis) rose from 78,000 tons to 6.48 million tons, up 8200 percent. Offset by rapid population growth, however, the grain output per capita increased from 209 kg to

298 kg, staying at a low level insufficient to fully meet subsistence needs.

## 2. From the start of the opening up to present.

Starting from the base of 300 billion kg, China's total grain output broke the four marks of 350 billion kg, 400 billion kg, 450 billion kg and 500 billion kg successively, in particular growing for five consecutive years from 2004, and the current production capacity stays stably at 500 billion kg. This has balanced the demand and supply of grain, satisfied growing consumption demand, and laid a material basis for eco-social development and further reforms. Such a great success is attributable to the following factors: (1) the household contract responsibility system was introduced to provide a strong stimulus for farmers to produce grain as well as liberalize and develop rural productive forces; (2) the grain distribution system reform was continuously developed to provide a market-driven mechanism in place of state monopoly for the purchasing and marketing of grain, define the minimum purchase prices for major crops, and create a national grain macro-control system that combines market function and government control; (3) the output per unit area was raised significantly, due to the development of farmland irrigation infrastructures, promotion of advanced technologies, continuous improvement in disaster resistance, and widespread application of hybrid paddy and corn; (4) the central government provided favorable financial policies in support of grain production, such as the Commodity Grain Base Counties program, the Large Commodity Grain Bases program, the Integrated Agricultural Development program, the High-quality Grain Project, the Seed Project and the Plant Protection Project, cancellation of agricultural duties, introduction of "Four Subsidies" (direct subsidy for grain production and general subsidies for fine strains, agricultural machinery procurement, and agricultural production supplies) for grain-growing farmers, which has helped increase the grain production capacity and brought visible benefits to farmers. As of 2007, the nationwide effective irrigation area stood at 850 million Mu, up 25.7 percent from 1978. Over 51 million tons of chemical fertilizers were consumed (in a pure basis), representing a growth of 480 percent from 1978. The rural power consumption increased from 1978 by 2100 percent to 550.99 billion KWH. The coverage of fine seed strains reached 95 percent and mechanized plowing, planting and harvesting accounted for 42.5 percent, up 116 percent from 1978.

## **(II) Changes in the Grain Production Landscape**

1. The focus of grain production has shifted to northern regions. Accelerated industrialization and urbanization in southeastern costal areas continuously expand into grain growing areas while grain production in northern regions [2] takes up an increasing weight in the national grain production. In 2007, the grain growing area in northern regions accounted for 55 percent of the national total and 52.5 percent of national output, an increase of 5 and 11.9 percent from 1980, respectively. The paddy output accounted for 17.7 percent of the national total, an increase of 11 percent points since 1980. Heilongjiang Province produced 7.6 percent of the national paddy output, representing an increase of 7 percent from 1980. The

grain distribution pattern has been reversed from “South-to-North Transfer” to “North-to-South Transfer”.

2. Grain production is concentrated in primary production areas and major grain production counties. In 2007, the 13 primary grain production proveniences (or regions) [3] produced 75 percent of the national grain output, an increase of 6 percent from 1980. The top 100 major grain production counties nationwide contributed 21 percent of the national grain output. According to the trans-provincial grain distribution data, the raw grains distributed across-province by the 13 primary grain production provinces (or regions) in 2007 accounted for 88 percent of the national total distributed across provinces, an 8 percent increase from 2005. The nine primary production areas, namely Heilongjiang, Jilin, Henan, Jiangsu, Anhui, Jiangxi, Inner Mongolia, Hebei and Shandong, contributed to 96 percent of the national total of net raw grain distributed inter-provincially, of which Heilongjiang produced the most net flow.

3. Intensive grain production is boosted to a higher level, along with great improvements in storage and transport facilities. Rising labor costs trigger an obvious trend of capital-labor substitution. More chemical fertilizers, plastic membranes and herbicides are used, and farming activities are more mechanized. In order to effectively raise productivity, mechanized plowing, planting and harvesting reached 42.5 percent, up 5 percent from 1998; in particular, wheat production has been mechanized basically at all stages. In addition, the capacity of grain storage and transport is increased gradually. The effective grain storage capacity and the daily drying capacity nationwide are expanded and six major grain distribution channels link northern and southern regions, providing an assurance for extensive grain distribution.

4. The mix of grain varieties and strains are optimized continuously. The mix of paddy, wheat, and corn gradually adapts to changes in consumption market. Corn contributed to 30 percent of the total grain output in 2007, up 12 percent from the 18 percent in 1978, to meet the needs from feedstuffs and industrial applications. The weight of wheat rose 4 percent from 18 percent to 22 percent, with a rising proportion of quality and specialty variety. The paddy proportion drops 8 percent from 45 percent down to 37 percent. However, the early season indica rice is reduced while the japonica rice increased to accommodate changes in food needs.

### **(III) Experience and Lessons**

1. Stable grain-growing area provides the basis for successful development and is a critical factor of grain output. The grain-growing area shrank from 1.71 billion Mu in 1998 to the all-time low of 1.49 billion Mu in 2003 before returning to 1.58 billion Mu in 2007, while grain production experiencing a fluctuation from 512.3 billion kg to 430.7 billion kg and back to 501.6 billion kg. History proves that maintaining a stable grain growing area is a prerequisite for steady development of grain production.

2. Encouraging farmers to grow grain is a fundamental measure. A broad variety of policies were introduced to encourage farmers to grow grain, including the household contract responsibility system, the elimination of the state monopoly for purchase and marketing of grain, the “Four Subsidies” for grain-growing farmers, and minimum purchase prices of grain. These efforts have provided stronger supports, brought visible benefits to farmers, stabilized grain-growing area, and raised grain output.

3. Relying on science and technological advancement is critical. Since the beginning of reform and opening up, the grain output per Mu has increased from 168.5 kg to 316.5 percent in 2007, and the total output from over 300 billion kg to more than 500 billion kg, mostly benefiting from the advancement of agricultural technologies. The cultivation and substitution of high-quality, high-yield, and multi-resistant strains are accelerated, with the grain output per Mu increased upon each substitution of new strains. Advancement of grain production technologies is manifested by wide spreading of hybrid paddy, compact corn, extensive application of precision and half-precision planting of wheat, plastic membrane mulching, and disease and pest control.

4. Boosting infrastructure provides an assurance. The government always considers grain production as one of the work priorities in agriculture and strengthens efforts to construct farmland and water conservancy infrastructures, and improves grain production conditions. In 2007, the national effective irrigation area expanded to 850 million Mu and surface drainage area increased to 320 million Mu, providing an obviously stronger resistance to and relief of disasters. The government supports the agricultural industry to accelerate technological transformation, upgrade processes and increase output, ensure supply of chemical fertilizers and other agricultural supplies, and improve agricultural equipments. These practices thereby provide strong support and assurance for grain production.

## **II. Grain Demand and Supply Situation in China**

In the 12 years ahead, with expanding population and rising living standards, China’s grain demand will continue to grow inevitably to widen the demand-supply gap, escalate structural contradictions of grain varieties and regions, and add to the difficulties in balancing demand and supply. This is also fueled by tight grain supply in international markets and increased uncertainties in market movement. Given the limited opportunity of filling domestic grain shortage with international grain resources, China must basically achieve grain self-sufficiency domestically. Despite increasing resource and environmental constraint on grain production, additional grain output can be achieved through expansion of investment, improvement of agricultural infrastructure, and increase of grain yield per unit area.

### **(I) Inevitable Increase in Grain Demand**

The Framework predicts that the national grain demand will reach 525 billion kg and 572.5 billion kg by

2010 and 2020, respectively. By purposes, food grain consumption will slightly drop; feed and industrial use will increase; seed use will remain stable.

## **(II) Widening Demand-Supply Gap of Grain**

Though the total grain output of China ensures self-sufficiency, the grain output per capita is only 380 kg, below the minimum targets of 389 kg by 2010 and 395 kg by 2020 set forth in the Framework. The demand-supply gap of grain will increase due to rising living standards of people, increase of livestock products, and rapid growth of the food industry.

Based on the 95 percent self-sufficiency in grain and 100 percent self-sufficiency in cereals defined by the Framework, the existing grain production capacity can meet the target for 2010. However for the 2020 goal, grain production capacity shows deficiency and suffers widening difference between grain varieties.

## **(III) Limited Opportunity of Utilizing International Markets to Cover the Deficiency**

Globally, it is costly and risky to satisfy the deficiency in domestic grain supply by utilizing the international markets, and the opportunity to do so is also limited.

First, limited grain resources are available in international markets. China is a major producer and consumer of grain. Grain traded in international markets is, estimated, one half of China's grain consumption, so a very small amount of grain resources are available to import for China.

Second, international grain markets experience great volatility. As the biomass fuel development has pushed grain demand up in the past few years, the global grain reserve has dropped to a 25-year low, which coupled by speculation in agricultural futures, has triggered a 40 percent rise in grain prices worldwide. Recently, grain prices have declined due to steep drop in crude oil prices and weakening demand for biomass fuels as a result of the international financial crisis. However in the medium to long run, international financial and energy markets will have bigger effects on grain markets, complexity will increase in factors that trigger grain market volatility, and many uncertainties remain in utilizing international markets to supply domestic grain deficiency.

## **(VI) More Constraints on Expansion of Grain Production**

At the present and future stages, China currently face and will continue to face constraints on grain production largely different from those seen before the reform and opening up. Major constraints include accelerated industrialization and urbanization, huge migration of agricultural labor force, deteriorating labor quality in grain production, and rising uncertainties of weather and worsening ecological environment, which are extremely detrimental to grain production.

First, water, and soil resources decrease. China boasts total water resource of 2,800 billion m<sup>3</sup>, ranking sixth in the world, and water resource per capita of about 2200 m<sup>3</sup>, only one fourth of the global average. Water distribution is uneven in both time and space. Precipitation is concentrated in June to September, with water shortage magnified during spring plowing and autumn or winter planting. Water and soil resources are not matched; for example, regions to the north of the Huaihe River hold about two thirds of the national arable area but receive less than one fifth of the national water resource. Limited arable area per capita is a basic national condition. The contradiction between the growing population and shrinking farmland will remain unsolved in the long run. The national arable area has shrunk from 1.95 billion Mu in 1996 to 1.826 billion in 2007, representing an annual decrease of 11 million Mu. The current arable area per capita is 1.38 Mu, only 40 percent of the global average. As industrialization and urbanization proceeds at a quicker pace, the arable area will continue to decrease

Second, comparative returns from growing grain remain low. Rising prices of agricultural inputs and labor force will increase the cost of grain production. With grain prices rising slower than costs and the comparative returns from growing grain remaining low, this situation remains detrimental to the farmers' willingness to grow grain. In some areas, grain production is shifting to food grain and part-time jobs, limiting the potential for additional grain output in the future.

Third, the quality of agricultural labor force is deteriorating. Most of the young and middle-aged individuals in rural areas are migrant workers, and have a weaker capability of gaining knowledge for new technologies, making it difficult to improve labor skills. These problems result in the difficulties of spreading new cultivation technologies and constrain advancement of grain technologies.

Fourth, weather uncertainties increase. China is a country frequently hit by floods and droughts. In the monsoon climate, precipitation changes within the year. Moreover, weather extremes occur more frequently under greenhouse effects that bring about global warming. As projected by China's Meteorological Administration, the outlook for China's weather condition is not optimistic. In 2020, the mean annual temperature will rise by 0.5-0.7°C from 2000. Precipitation will face many uncertainties and the demand-supply contradiction of water resources will increase. In addition, climate change will entail frequent weather extremes that expose grain production to more severe droughts, floods, and temperature extremes, which bring more plant diseases and insect pests.

Fifth, ecology environment is worsening. Presently, serious over-exploitation of underground water in some northern regions, predatory use of farmland, as well as protracted and massive use of chemical fertilizers and plastic membranes has lead to farmland being less productive. Desertification, deterioration, soil erosion and non-point source pollution also contribute as serious water issues. Environment



deterioration and the content of heavy metals and organic pollutants far exceed limits in some farmland alongside trunk roads and rivers. These problems have seriously affected grain quality and returns.

In addition, China's agricultural infrastructure remains underdeveloped, resulting in a large proportion of low-to-medium-yield farmland and weak resistance to disasters. Of present farmlands, low-to-medium-yield farmland accounts for two thirds, characterized by unsteady grain output per Mu and substantial fluctuation between years. The effective irrigation area of farmland is less than 47 percent of total farmland. Irrigation and draining facilities are desolated, supporting works are not in place, water resources are not utilized efficiently, resistance to natural disasters is weak, and the heavy reliance of agriculture on weather conditions has not changed.

#### **(V) Potential Remains for Additional Grain Output**

Despite unfavorable factors facing grain production at the present time, potential remains for increase in China's grain output in the long run. China now lags far behind developed countries in the grain yield per unit area, with that of paddy, wheat, and corn standing at 425 kg, 300 kg and 350 kg respectively, representing 71 percent, 60 percent and 67 percent of the average level of the top ten countries by grain yield per unit area. Even in the same growing region, grain yields per unit area are significantly different between provinces; sometimes such difference may exceed 50 kg. From a historical perspective, the grain yield per unit area grew 3.2 percent during 1949-1978 and 1.9 percent during 1979-2007. In the coming 12 years, with the growing area unchanged, the planned increase of 50 billion kg only requires a 0.9 percent annual growth in the grain yield per unit area. Therefore, the defined objective of grain output increase is achievable through expansion of investment, improvement in agricultural production conditions and boosting of technological supports.

First, the grain production environment policy is optimized continuously. The CPC Central Committee and the State Council insist that national grain security top the list of economic priorities and consider grain production as the first and foremost task in modern agricultural development. Local governments at all levels implement policies the central government introduces to strengthen agriculture, benefit farmers, and relentlessly increase efforts to support and safeguard grain production. Since 2004, the State has cancelled agricultural duties, introduced incentives for major grain production counties and the "Four Subsidies", and established minimum purchase prices of grain, market-stabilizing purchase and storage system, and other subsidies for grain production. As its overall national strength increases, China will continue to increase subsidies for grain production, raise minimum purchase prices of grain, and further boost farmers' willingness to grow grain.

Second, agricultural production conditions are improved gradually. According to the survey data on typical

regions provided by China Academy of Engineering, the wheat yield per unit area in irrigated regions is 1.67-1.89 times that of drought regions, and the corn yield per unit area in irrigated regions is 1.47-1.53 times that of drought regions. Furthermore, irrigated regions provide higher stability to grain output. By providing and perfecting irrigation and drainage, improving soil structure, and increase soil fertility, the disaster resistance of grain production can be strengthened to increase grain yield per unit area by 15-20 percent.

Third, agricultural technologies are promoted at a quicker pace. The conformity level of agricultural technologies remains low in China. Farm-saved seeds of traditional crops are replanted in a large proportion, high-yield grains are not broadly used, main varieties are too many and in disorder, high-yield growing technologies are not effectively promoted, and the potential of existing strains are not fully tapped. According to the experience obtained in the National High-yield Grain Program, use of fine strains as well as assembly and integration of agricultural machinery and agronomy, the grain output per Mu can be increased by 50-75 kg.

Fourth, pre- and post-production assurance is boosted. Currently, plowing, planting and harvesting activities are mechanized at a low level; grain drying, storage, and transport capacities do not match needs. Grain productivity is increased through improving the quality and introducing additional models of agricultural machinery and advancing commercialized services; grain collection, storage and distribution capacities are expanded through further developing drying, storage and transport facilities, thereby providing a strong assurance before and after grain production.

### **III Guidelines, Principles and Objectives**

#### **(I) Guideline**

To fully implement the spirit of the 17th CPC National Congress and the Third Plenary Session of the 17th Central Committee of the CPC; adhere to Deng Xiaoping Theory and the "Three Represents" as guidance; deeply implement the scientific view of development; remain on the track of agricultural modernization with Chinese characteristics; uphold the policy of basically achieving self-sufficiency in grain domestically, strengthen policy supports; expand investment, improve infrastructure, heighten equipment level, drive technological advancement and transform development modes; establish a sustainable mechanism of continuous and steady grain development; maintain and increase farmers' willingness to grow grain, technological personnel's enthusiasm for innovation and local governments' resolution to develop grain production; increase grain yield of farmland, resource utilization efficiency and labor productivity; continuously boost the overall capacity of grain production, risk resistance, international competitiveness and development sustainability; safeguard national grain security.

## **(II) Principles**

1. Rely on domestic resources and basically achieve self-sufficiency. Focus on development of grain production capacity; accelerate creation of a grain security assurance system that provides stable supply, sufficient reserve, strong regulation, and efficient operation, thereby enabling China to remain 95% self-sufficient in grain. Always consider grain production as the first and foremost task of modern agricultural development, promote agricultural restructuring in a scientific and orderly way, coordinate land allocation between grain and industrial crops, and ensure stabilization of grain growing area.
2. Focus on increasing grain yield per unit area in reliance on technologies. Adhering to the track of intensive development, strengthen technological supports for agriculture, accelerate promotion of fine strains, good methods as well as advanced and feasible technologies for energy conservation and irrigation, provide and improve farmland infrastructure and equipment, fully tap into the potential for additional output, increase the grain yield per unit area, and ensure steady enhancement of the overall capacity of grain production.
3. Optimize allocation and focus on priorities. Further optimize grain production allocation by giving an overall consideration to regional natural resources, eco-social development and grain production bases. Endeavor to build core zones of grain production; surround large irrigated areas, base on cities or prefectures where major grain production counties locate, define priority zones regardless of the boundaries of administrative regions, centralize investment, seek overall advancement, and eventually form centralized, consecutive national commodity grain production bases with a steady and high yield.
4. Overall planning and stepwise implementation. Provide an overall planning for developing grain production capacity of primary production areas, primary distribution areas and balance areas based on the target of grain output expansion, take region-specific comprehensive measures to uniformly plan development of priority areas, and carry out various projects simultaneously to ensure continuity of projects and availability of auxiliary services. Make reasonable arrangements for particulars and schedule of projects based on feasibility and the order of priorities, push forward development in all aspects in a planned and stepwise way and accelerate improvement in grain production conditions.
5. Innovative mechanism and sustainable development. Deepen rural reforms, support economic growth in primary production areas of grain using fiscal, tax, price, financial and legal measures, establish the benefit compensation system for primary production areas, and create a sustainable mechanism that enables steady grain growth and continuous income rise of farmers. Innovate in management mechanism, accelerate integration of projects and enhance work division and cooperation. Speed up the creation of a new mechanism for farmland and water conservancy development. Lay stress on protection of water resources

and ecological environment, improve the utilization modes and price mechanism of agricultural water, strengthen efforts to prevent and control non-point source pollution, and boost the sustainability of grain production development.

6. Diversify funding sources and expand investment. Further adjust the mix of government funding, fixed asset investment and credit extension, continuously increase governments' financial supports for developing the overall capacity of grain production, and give more weight to grain production capacity development projects in existing agriculture-related investments. Improve policies on grain subsidies, price supports and incentives, maintain and increase farmers' willingness to grow grain and local governments' resolution to develop grain production, and guide private capital to grain production capacity development to diversify investors.

### **(III) Objectives**

#### **1. Final Objectives**

Steadily increase the overall capacity of grain production. The national grain production capacity will reach 550 billion kg by 2020, 50 billion kg beyond the existing capacity. Maintain stability of grain growing area. By 2020, the total farmland of China will be retained at 1.8 billion Mu as minimum, with prime farmland area being 1.56 billion Mu and grain growing area being 1.58 billion Mu or higher. Markedly improve grain production conditions. By 2020, the effective irrigation area of farmland nationwide will reach 900 million Mu or higher, representing an effective irrigation rate of 51 percent, up 4 percent from 2007; the irrigation water utilization factor [4] will touch 0.55 percent or so. Farmland quality will improve gradually; 300 million Mu of low-to-medium-yield farmland will be upgraded; mechanization rate of plowing, planting and harvesting will increase by 65 percent; loss rate of grain production due to natural disasters will drop from 10 percent to 8-9 percent, down 1-2 percent. Increase the technological level of grain production. By 2020, the grain yield per Mu will arrive at 350 kg on average, up 33.5 kg from 2007; the coverage rate of fine grain strains will remain at 95 percent or above; fine grains will be fully upgraded once or twice; commercialized seed supply rate will reach 85 percent; technological contribution rate will climb from 48 percent to 55 percent, an increase of 7 percent.

#### **2. Staged Objectives**

By 2010, the national grain production capacity will remain stable at 500 billion, slightly higher than the existing level; by 2015, the national grain production capacity will reach 530 billion kg, 30 billion kg beyond the existing capacity; by 2020, the national grain production capacity will reach 550 billion kg, 50 billion kg above the existing level.

### **IV. Main Technological Approaches**

In response to main constraints on grain production in China, the technological approaches to expanding

grain output in the next 12 years are mainly to upgrade existing irrigation and drainage facilities, increase irrigation area where conditions permit, and improve production conditions. It also includes plans to spread fine strains and high-yield technologies to combine fine strains and advanced processes; reform farming systems to fully tap into the potential of limited resources; promote advanced and feasible agricultural machinery and auxiliary technologies; accelerate mechanization of grain production; prevent and control major diseases and pests to minimize loss from natural disasters.

**(I) Improve irrigation conditions and upgrade low-to-medium-yield farmland.**

Construct and upgrade existing irrigation and drainage facilities, improve farmland and water conservancy infrastructures, expand irrigation area where conditions permit, improve soil fertility, extensively upgrade low-to-medium-yield farmland, build grain fields with high and stable yield regardless of floods and droughts, and further increase the productivity of farmland.

**(II) Select, nurse, and spread fine strains.**

Combine modern bio-technologies and conventional technologies, further strength efforts to select and nurse fine strains, tap into the potential of seed resources, and foster fine strains that provide high yield, strong resistance and broad suitability. Focus on new corn strains that allow dense planting, resist diseases and pests and suitable for mechanized farming, new paddy strains suitable for various production conditions in different regions and providing high yield, good rice quality, and multi-resistance, dedicated wheat strains that provide multi-resistance and high yield as well as new soybean strains that feature high oil content, high yield and multi-resistance; accelerate research and development of new strains of transgenic soybean. Meanwhile, step up efforts to spread fine strains, increase commercialization, and large-scale planting of fine strains.

**(III) Improve farming methods.**

Increase farmland productivity by reforming farming systems, methods, and fully utilizing light, heat, water, and soil resources. Shift corn inter-planting to direct seeding in the Huang-Huai-Hai Region as appropriate; promote protective cultivation in northern regions to balance soil fertility; vigorously develop winter fallow farmland in southern regions; increase the coverage of double-harvest rice and raise multi-cropping index by scientific selection and matching of grain and oil strains in middle-to-lower reaches of the Yangtze River.

**(IV) Spread main technological measures.**

Enhance technological guidance, guide farmers through the standardized cultivation process, and increase the technological conformity level. The priority technologies to be spread are: 1) for corn with dense planting, ditch sowing on fully mulched double ridges, sprouting, and bed-irrigation sowing; 2) for paddy

use greenhouse seedling production, centralized seeding production, use of seedling strengthening agents, throwing transplanting, mechanized transplanting, and precision sowing; 3) for wheat with precision and half-precision sowing, and “Double Late” technology; and 4) for soybean use dense planting, inter-row mulching, and seed coating. Other technologies to be implemented are auxiliary technologies such as testing soil for formulated fertilization and water-fertilizer coupling. We will also promote agricultural water conservancy technologies to increase water utilization efficiency, including drip irrigation under mulching, mulched ridges, rainwater collection for irrigation, seepage control of canals, and low-pressure water pipeline. As estimated by the Ministry of Agriculture, dense corn planting will push up the corn output per Mu by about 50 kg and currently may be applied to 300 million Mu of farmland; greenhouse seedling production will raise paddy yield per Mu by 10-25 kg; and the “Double Late” technology will yield over 5 kg additional wheat or corn per Mu.

#### **(V) Increase the level of agricultural mechanization.**

Fully exert the role of agricultural machinery into cutting cost, raising efficiency, and substituting labor along with accelerating mechanization for main crops and critical processes. In northern drought areas, accelerated mechanization for deep scarification and soil preparation, no-tillage sowing and deep application of chemical fertilizers; enhance combination of agricultural machinery and agronomy; in southern paddy fields, spread such technologies as efficient soil preparation, straw burying, mechanized irrigation, and drainage. As estimated by the Ministry of Agriculture, deep scarification and plowing can improve the soil layer structure, preserve heat and moisture, and raise grain yield per Mu by about 10 percent.

#### **(VI) Strengthen efforts to prevent and control diseases and pests.**

Enhance forecast, prevention, and control of diseases and pests; use pesticides scientifically and reasonably; and reduce pesticide consumption and mitigate losses from diseases and pests. On average, China’s grain growing area hit by diseases and pests a year is about 800 million Mu (and times) for corn, 1.7 billion Mu (and times) for paddy, and 1 billion Mu for wheat (and times). The grain loss rate due to diseases and pests is 5 percent. A one percent decline in the loss rate will save about 2.5 billion kg of grain.

### **V. Production Zoning and Zone-specific Expansion of Grain Production**

The grain growing areas nationwide are divided into core zones, major grain production counties in secondary production areas, reserve zones, and other zones by agricultural zoning characteristics. These characteristics include production technology conditions and technological potential for production expansion. The production expansion tasks specific to zones and grain varieties are defined under the principles of utilizing comparative strengths, focusing on priority strains, emphasizing outward distribution capacity, and achieving regional balance.

## **(I) Functions of Zones**

1. Develop the core zones for grain production to increase outward distribution of commodity grain. Based on considerations for grain growing acreages, grain output, commodity grain amount, centralization and consecutive pieces of farmland and availability of water resources, 680 counties (or cities, districts, farms) out of 13 primary grain production provinces (or regions) are identified as core zones for grain production. These core zones are responsible for completely improving farmland quality by strengthening development of farmland and water conservancy infrastructure and upgrading farming methods; boosting the capability of technological innovation; accelerating selection, nursing, and spread of fine strains; improving grain storage and transport facilities; and eventually enhance their core status in commodity grain supply of China.

2. Boost development of major grain production counties to increase regional self-sufficiency. 120 major grain production counties (or cities or districts) are identified out of 11 secondary grain production provinces (or autonomous regions or municipalities directly under the Central Government), namely, Shanxi, Zhejiang, Fujian, Guangdong, Guangxi, Chongqing, Guizhou, Yunnan, Shaanxi, Gansu and Ningxia. These major grain production counties are responsible for focusing on development of farmland and water conservancy facilities and farmland standardization, increasing soil fertility and controlling soil erosion, and strengthen prevention and relief of disasters. They will also work on improving the scientific support and service system, increasing the conformity rate of grain production technologies, accelerating spread of high-yield technologies, promoting agricultural mechanization, fully tapping into the potential for expanding grain yield per unit area, and eventually increasing regional grain supply.

3. Develop reserve resources for grain production as appropriate to boost strategic grain reserves of the country. Give priority to uncultivated arable lands in Western Jilin and other regions when deploying major water conservation projects, minding proper protection of ecological environment. Develop reserve land resources to an appropriate degree and at appropriate time in line with the domestic demand-supply status of grain.

4. Expand national grain production. Other non-discussed zones are to stabilize grain growing acreage, improve grain production conditions and accelerate spread of fine strains as well as advanced, feasible technologies through policy guidance and technological spreading, thereby expanding grain production.

## **(II) Introduction to the Four Categories of Zones**

1. Core Zones: Core zones consist of 680 counties (or cities, districts or farms) scattered in the northeastern region, the Huang-Huai-Hai Region, and the Yangtze River basin.

Northeastern region. This region is China's largest producer of corn, high-quality japonica rice and soybean, composed of 209 counties (or cities, districts or farms) from Heilongjiang, Jilin, Liaoning and Inner Mongolia, accounting for 31 percent of total core counties. The total cultivated area is 340 million Mu, representing 18.5 percent of the national total; the grain growing area is about 260 million Mu and the total grain output is 87 billion kg, contributing to 16.4 percent and 17.6 percent of the national total, respectively.

Huang-Huai-Hai Region. This region is a privileged production area for wheat, corn and paddy, consisting of 300 counties (or cities or districts) from Hebei, Shandong, Henan, Anhui and Jiangsu, accounting for 44 percent of total core counties. The total cultivated area is 320 million Mu, accounting for 17.7 percent of the national total. The grain growing area is about 370 million Mu and the total grain output is around 143.25 billion kg, contributing to 23.2 percent and 28.9 percent of the national total, respectively.

Yangtze River basin. This region is a centralized production area for paddy, consisting of 171 counties (or cities or districts) from Jiangxi, Hubei, Hunan, and Sichuan, accounting for 25 percent of total core counties. The total cultivated area is 120 million Mu, accounting for 6.6 percent of the national total. The grain growing area is about 180 million Mu and the total grain output is around 71.45 billion kg, contributing to 11.7 percent and 14.4 percent of the national total, respectively.

## 2. Major Grain Production Counties in Secondary Production Areas

120 major grain production counties (or cities or districts) out of 11 secondary production provinces (or regions or municipalities) are scattered in the Eastern & Southern Region, the Southwestern Region, Shanxi Province, and the Northwestern Region.

Eastern & Southern Region. This region includes 42 counties (or cities or districts) from Zhejiang, Fujian, Guangdong, and Guangxi, accounting for 35 percent of total major grain production counties in secondary production areas.

Southwestern Region: This region includes 38 counties (or cities or districts) from Chongqing, Guizhou, and Yunnan, accounting for 32 percent of total major grain production counties in secondary production areas.

Shanxi Province and Northwestern Region. This region includes 40 counties (or cities or districts) from Shanxi, Shaanxi, Gansu, and Ningxia, accounting for 33 percent of total major grain production counties in secondary production areas.



### 3. Reserve Zones

Western Jilin and other appropriate regions.

### 4. Other Zones.

Other zones refer to grain growing counties (or cities or districts) other than zones already stated. The total cultivated area is nearly 1 billion Mu, the grain growing area 690 million Mu, and the grain output 165.95 billion kg, accounting for 53 percent, 43.6 percent and 33.5 percent of the national total, respectively.

## **(III) Zone-specific Expansion of Grain Production**

### 1. Principles of Production Capacity Allocation

Give more weight to primary production areas, in particular to core zones in primary production areas, based on production characteristics, grain growing acreage, and potential for production expansion. Give due consideration to major grain production counties in secondary production areas, and eventually drive up the national grain production.

### 2. Zone-specific Objectives and Approaches

Under the principles of production capacity allocation, the national grain production capacity will be increased by 50 billion kg, of which 37.1 billion kg or 74.2 percent is allocated to core zones, 2.25 billion kg or 4.5 percent to major grain production counties in secondary production areas, 2.25 billion kg or 4.5 percent to reserve zones, and 8.4 billion kg or 16.8 percent to other zones.

#### (1) Core Zones

Northeastern Region: To produce 15.05 billion kg or 30.1 percent of the planned increase in national grain production. There are three major constraints on grain production in this region: (1) floods in the eastern part and droughts in the western part, insufficient works for water storage, diversion, and lifting, and underdeveloped farmland irrigation and drainage facilities. Some areas have a large cultivated acreage, paddy production areas are much irrigated from underground water and wetlands are deteriorating and shrinking; (2) constraint includes extensive cultivation in the majority of the region, insufficient density of corn planting and out-of-date methods of paddy seedling production; (3) constraint refers to soil compaction, shallow hardpan, and deteriorating farmland quality.

Main approaches to production expansion: (1) execute new water supply projects to an appropriate extent, increase water supply for irrigation, extend the irrigation area, accelerate development of the flood control and drainage system, strengthen efforts to expand existing irrigation areas and update them for water conservancy, improve irrigation facilities, and heighten irrigation assurance rate and flood drainage standards; (2) extensively promote dense corn planting and greenhouse paddy seedling production; apply

dense planting reasonably; (3) spread the use of large agricultural machinery, promote total mechanization of grain production, carry out deep scarification and plowing, reuse straws as fertilizers and increase retention of water and moisture.

**Huang-Huai-Hai Region:** To produce 16.45 billion kg or 32.9 percent of the planned increase in national grain production. There are two major constraints on grain production in this region. First, water supply is obviously insufficient due to limited potential for surface water exploitation and over-exploitation of underground water, farmland and water conservancy facilities are desolated, shrinking irrigation area is broadly seen, and floods and droughts occur frequently in a year. Second, crop inter-planting is extensive and maturities of crops are not matched, which affects autumn grain yield per unit area. Main approaches to production expansion include: (1) vigorously develop water-efficient agriculture, expand existing irrigation areas and upgrade for water conservancy, and increase irrigation water utilization efficiency and returns. Accelerate flood control and drainage projects in the Huaibei Plain and the Lixiahe Region, and heighten the standards for farmland flood control and drainage; (2) promote grain varieties and strains that allow dense planting, inter-planting and mechanized harvesting, promote drought-enduring species, late harvesting of corn and late sowing of wheat.

**Yangtze River basin:** To produce 5.6 billion kg or 11.2 percent of the planned increase in national grain production. There are three major constraints on grain production in this region. First, flood control facilities are underdeveloped in some areas, flood control standards remain low, waterlog-related diseases and pests are serious, and severe water shortage occurs in Sichuan basin and Southern Hunan. Second, paddy seedling production is weak, planting density remains low, and double harvesting is markedly shifting to single harvesting. Third, agricultural mechanization remains low. Main approaches to production expansion include: (1) step up efforts to drain low-lying, waterlogged lands and lake shore-lands, expand irrigation area and increase irrigation assurance rate; (2) promote seedling production workshop and throwing transplanting technologies, spread mechanization of transplanting and harvesting, improve seedling quality, and raise the conformity rate of agricultural technologies; (3) expand the growing acreage of double-harvest rice and increase the multi-cropping index.

## (2) 120 Major Grain Production Counties in Secondary Production Areas

**Eastern & Southern Region:** To produce 600 million kg or 1.2 percent of the planned increase in national grain production. Major constraints on grain production in this region are rapidly decreasing in arable land and declining in grain growing acreage. Major approaches to production expansion include protecting farmland, enhancing land consolidation and rehabilitation, stabilizing grain growing acreage, and strengthening efforts to develop farmland and water conservancy infrastructure.

Southwestern Region: To produce 500 million kg or one percent of the planned increase in national grain production. Major constraints on grain production in this region include widespread hillside farmland, limited water supply for drought relief and irrigation, serious soil erosion, and desolated water conservancy facilities in flat areas. Main approaches to production expansion include: (1) improve farmland and water conservancy facilities in flat areas, step up development of small water storage and lifting facilities, such as ponds, pools and dams, expand irrigation area, and ensure availability of water for grain production; (2) upgrade hillside farmland to standard grain fields; (3) focus efforts on prevention and control of paddy diseases and pests.

Shanxi Province and Northwestern Region: To produce 1.15 billion kg or 2.3 percent of the planned increase in national grain production. Water shortage is the major constraint on grain production in this region. Main approaches to production expansion include: (1) develop dry and water-efficient farming with a boost in collection, storage and utilization of rainwater; (2) construct soil-retaining dams; (3) accelerate development and spread of drought-enduring grain species; (4) promote water conservancy technologies including membrane mulching and sowing in beds pre-irrigated through injection.

### (3) Reserve Zones

By 2020, these zones will produce 2.25 billion kg or 4.5 percent of the planned increase in national grain production. Reserve zones will be developed to an appropriate extent at an appropriate time in line with the demand-supply status of grain nationwide. Launch pilot projects where conditions permit, and determine the scale and progress of land exploitation under the principles of biological friendliness, availability of water, water-land matching, and demand-driven production. Major exploitation measures include preparation of wastelands on hillsides and watersides, exploitation of water resources for irrigation, expansion of irrigate area, increase of soil fertility, and creation of farmland with high and steady yield.

### (4) Other Zones

By 2020, these zones will produce 8.4 billion kg or 16.8 percent of the planned increase in national grain production. Except a few counties where good production conditions are available, the majority of these zones are plateaus, hills, mountainous areas, grasslands and desert edges where water and land resources are not matched and farmland is of poor quality. Main approaches to production expansion are to fully utilize natural precipitation, appropriately exploit water resources and promote fine strains and high-yield planting technologies.

## **V. Major Tasks and Projects**

### **(I) Major Projects**

To achieve the overall objective of increasing grain production capacity by 50 billion kg, the most

important is to develop core zones for grain production and major grain production counties in secondary production areas into national commodity grain production bases furnished with complete farmland facilities, services and storage spaces, demonstrating economics of scale, and providing consecutive pieces of farmland. To that end, the following eight programs should be implemented in line with characteristics, constraints, and production expansion approaches in the Northwestern Region, Huang-Huai-Hai Region and the Yangtze River basin: (1) major water conservancy project; (2) prime farmland development; (3) grain research and innovation projects; (4) fine strain breeding and agricultural technology promotion system; (5) agricultural mechanization system; (6) disaster prevention and relief system; (7) agricultural eco-environment protection system and grain storage; and (8) logistics and processing capacity.

#### (I) Major Water Conservancy Projects

1. Medium- and large-sized irrigation areas and auxiliary works. Vigorously develop water-efficient farming, accelerate expansion of large and selected medium irrigation areas to upgrade for water conservancy, leverage the economics of scale in irrigation area upgrading, improve and expand effective irrigation area, boost management and IT level of irrigation areas, raise irrigation assurance rate, and increase water resource utilization efficiency. By 2020, upgrade 180 million Mu of irrigation areas, raise irrigation water utilization factor to 0.55 or higher, and complete expansion of large and selected medium irrigation areas to upgrade for water conservancy. Specifically, the Northeastern Region is to boost efforts to execute major large irrigation area projects and auxiliary farmland projects, improve irrigation methods, and expand surface water irrigation. Huang-Huai-Hai Region is to strengthen efforts to prevent channel seepage in large and medium irrigation areas, optimize the irrigation mode of combining wells and channels, reduce over-exploitation of underground water, efficiently utilize rainstorm water and flood resources, accelerate spread of water-efficient irrigation technologies, and improve water utilization efficiency. The Yangtze River basin is to expand irrigation area by focusing on expansion of large and medium irrigation areas as well as stabilize and increase the double-harvest rice growing acreage.

2. Implement new water supply projects as appropriate. Carry out storage, diversion, and lifting projects where water and land resources are matched, increase water supply for irrigation, and expand effective irrigation area of farmland. Accelerate expansion of the Nenjiang river diversion project, including Nierji in Songnen Plain, Hadashan water conservancy project, and other projects, improve the water allocation network and create standard farmland that ensures steady output regardless of floods and droughts. Establish new reservoir irrigation areas in the Yangtze River basin as appropriate to expand irrigation as soon as possible. Accelerate construction of medium-sized reservoirs that mainly serve as irrigation water sources in the Southwestern Region to address water shortage.

3. Upgrade large and medium irrigation and drainage pumping stations. Based on the upgrading of large

drainage and irrigation pumping stations in the central four provinces, upgrade large and medium irrigation and drainage pumping stations in north Anhui Province, alongside Yellow River, and in the middle-to-lower reaches of Yangtze River, mainly on lakesides, strengthen development of auxiliary works in water-logging control areas, raise water-logging control standards to once every 3-5 years for farmland prone to water-logging, and mitigate effects of moderate floods on grain production. Upgrade irrigation pumping stations in the Northeastern Region and alongside Yellow River; reduce energy consumption and pumping cost.

4. Emergency water supply for drought relief. In areas with poor irrigation conditions and insufficient irrigation water, carry out small-sized drought relief projects to provide small drought relief machinery, expand the bed-irrigation sowing acreage, and boost drought resistance to retain grain yield.

Table 1: Major Projects for Water Conservancy
Expanding large and medium irrigation areas and upgrading for water conservancy: Complete expansion of large and selected medium irrigation areas and upgrade for water conservancy, increase effective irrigation area by 41 million Mu, upgrade 143 million Mu of irrigation, and increase 135 million Mu of water-efficiency irrigation. New irrigation areas: By 2020, complete new irrigation areas, including Nierji, and medium-sized reservoir irrigation areas in Yunnan, Guizhou, Sichuan, Chongqing and Hunan. Also increase 16.5 million Mu of irrigation and upgrade 14.3 million Mu of irrigation. Upgrading large and medium irrigation and drainage pumping stations: Upgrade large and medium irrigation and drainage pumping stations to improve water supply and flood control in irrigation areas. Emergency water supply for drought relief: Provide emergency water supply for drought relief in areas with poor irrigation conditions and insufficient irrigation water.

**(II) Prime Farmland Development**

1. Farmland works. Under the principles of consecutive development and overall advancement, carry out farmland works based on small farmland water conservancy facilities; execute auxiliary works including land consolidation, tractor roads and farmland shelterbelts; improve soils, increase application of organic fertilizers and test soil for formulated fertilization; upgrade medium-yield fields in core zones and major grain production counties in secondary production areas to high-yield fields resistant to floods and droughts; upgrade low-yield fields to medium-yield fields with stable grain output; create commodity grain production bases sized at 800,000 Mu or above in northern regions and 500,000 Mu or above in the southern regions to provide economics of scale and consecutive pieces of farmland. By 2020, upgrade 300 million Mu of farmland with low and medium yields and reduce over one half of the farmland with low and medium yields in core zones and major grain production counties in secondary production areas.

2. Land consolidation and rehabilitation. Continue land consolidation and rehabilitation projects to insurance balance between requisition and addition of farmland. Focus will be on land consolidation in the Liaohe River basin and hilly areas in west Henan Province to expand effective farmland acreage. There is plan to regulate relocation of topsoil where major infrastructures were built for improvement of new farmland. Rehabilitate wastelands, abandoned lands and vacant lands, and improve the quality of rehabilitated lands are also priorities. By 2020, 20 million Mu of land will be prepared and rehabilitated in 800 major grain production counties and reserve zones.
  
3. Development of Farmland Quality Monitoring Capability. Plan to establish regional stations for farmland quality monitoring, form a network of farmland quality monitoring with reasonable deployment and complete functions, and improve the capability of farmland quality monitoring.

Table 2: Major Projects and Financial Supports for Prime Farmland Development
<p>Farmland works: Upgrade 300 million Mu of low-to-medium-yield farmland through small-sized farmland water conservancy facilities, land consolidation and farmland shelterbelts and such services as fine strain development, plant protection increase and agricultural technology promotion; 150 million Mu out of the 300 million Mu will be financed by the overall agricultural development fund, and another 300 million Mu financed by the central fund for infrastructure investment.</p> <p>Land consolidation and rehabilitation: Prepare and rehabilitate 20 million Mu of land in 800 major grain production counties and reserve zones, and ensure balance between acquisition and addition of farmland.</p> <p>Financial supports for formulated fertilization based on soil test: Provide all agricultural counties with subsidies for formulated fertilization based on soil test; provide subsidies for farmers who reuse straws as organic fertilizers, grow green manures and apply organic fertilizers.</p> <p>Development of farmland quality monitoring capability: Establish regional stations for farmland quality monitoring to form a network of farmland quality monitoring with reasonable deployment and complete functions.</p>

**(III) Development of Grain Research and Innovation Capability**

Create technology innovation platforms. Plan to accelerate development of paddy, wheat, and corn engineering laboratories and creation of laboratories for efficient utilization of soil fertility and efficient water utilization for crops. Also will improve research and testing conditions, furnish and upgrade instruments and equipments, and improve research approaches. Strengthen fundamental researches by the following: promote original innovation and integrated innovation of agricultural technologies and re-innovate through introduction and absorption; make breakthroughs in molecular technology applications, parent creation, and other seed breeding technologies; accelerate development of seed strains that provide high yield, good quality, broad suitability, stress resistance, and disease resistance; develop advanced planting, new fertilizers, and water conservancy technologies and equipments; and establish the grain

technology pool and technological supports. We must fully exert the role of agriculture and water conservation research institutions, universities, and high-tech parks to integrate resources, optimize deployment and increase investment, so as to create an open-ended research and development platform, establish and improve research collaboration, clarify staged research objectives, use joint efforts to make breakthroughs, and improve the overall research level. Plans are to carry out major transgenic species development projects and accelerate research on new transgenic grain species with high yield to improve grain output per unit area.

Table 3: Major Projects for Grain Research and Innovation
<p>Grain engineering laboratories: Create laboratories and technological integration pilot bases for breeding and planting of paddy species that provides high yield and resistance to diseases, stress, and droughts, discover excellent genes of paddy, and introduce, select, and nurse said strains. Create research and development platforms and technological integration pilot bases for wheat in respect of parental innovation, high yield, multi-resistance and efficient breeding and planting technologies; accelerate research on new wheat species, drought resistance, water conservancy and protective planting. Create research and development platforms and technological integration pilot bases for corn in respect of germ-plasm innovation, selection and breeding of seeds and efficient planting, make breakthroughs in discovery of genes of germ-plasm resources, species improvement and breeding technologies; create an efficient corn breeding technology system. Establish national engineering laboratories for efficient utilization of soil fertility and water resources, and accelerate development of common key technologies.</p> <p>National key seed production bases: Create the Nanfan research and seed production base in Hainan Province; provide overall planning and integrate resources to form a research and seed production platform; improve farmland facilities and seed production equipment, approaches and capabilities; establish seed production bases for hybrid corn in Gansu Corridor and hybrid paddy in Sichuan; improve farmland irrigation and control of diseases and pests; provide instruments and equipments for storage, drying and quality testing of fine seed strains; improve fine seed production and supply capability.</p>

2. Establish national key seed production bases. There are plans to create the Nanfan research and seed production base in Hainan Province, deploy seed production fields scientifically, improve public service facilities for experiments and seed testing, and accelerate reproduction, purification and screening of breeding materials. Other plans include to establish seed production bases for hybrid corn in Gansu Corridor and hybrid paddy in Sichuan, improve irrigation and drainage facilities for seed production fields, improve soil fertility, guide enterprises through furnishing facilities and equipments for refining, drying and storage, improve large-scale and standardized seed production, and stable seed supply for hybrid corn and paddy.

**(IV) Development of the Fine Strain Breeding and Technology Promotion System**

1. The following sentences include plans for implementing the development of the fine strain breeding and technology promotion system. Fine strain breeding and promotion. Establish zoned, large-scale, standardized, and specialized bases for fine strain breeding in line with ecological characteristics of different regions, improve seed production fields, provide facilities, and equipments for seed testing, drying, processing and storage, and fully boost the capability of fine seed production and supply assurance. Accelerate construction of paddy seedling greenhouses and workshops, improve paddy seedling capacity, and increase the yield per area and quality. Step up efforts to develop the seed quality testing system, boost the ability to test seed quality, and evaluate seed strains. Continue to improve regional testing of crop varieties, improve testing conditions and equipment, and assure the scientific basis and accuracy of tests. By 2020, maintain the fine strain coverage at 95 percent or above, and endeavor to raise commercialized seed supply from the current level of 80 percent to 85 percent.
2. Integration and promotion of high-yield planting technologies. Continue to implement the high-yield grain technology project, deepen the high-yield grain campaign and the agricultural technology penetration program, carry out 10,000 Mu of high-yield grain farmland pilot project, and promote fine strains. Plans also include an effort to integrate, demonstrate and promote advanced, feasible high-yield planting technologies along with enhancing technological training and guidance, providing door-to-door technological services, and providing field guidance on good methods. Further improve the research findings commercialization and promotion mechanism, and extend its outreach are expected.

Table 4: Major Projects and Financial Supports for Technology Promotion
Fine seed breeding project: Establish regional and large-scale fine seed breeding bases in core zones for grain production and major grain production counties in secondary production areas; increase seed production and supply capability; erect seedling greenhouses in northern regions and paddy seeding greenhouses in southern regions.
Subsidy for find seed strains: The central government will provide additional subsidy and improve subsidy procedures to increase coverage of fine strains of crops.
Financial supports for high-yield grain campaign and technology penetration: The central government will provide additional subsidy in support of high-yield grain campaign and technology penetration into rural households.
Subsidy for agricultural technology promotion at grassroots levels: In addition to accelerating reform in agricultural technology promotion at grassroots levels, provide addition financial subsidies from state revenue in support of non-profit agricultural technology promotion organizations at grassroots levels in providing technological services.



3. Develop the grass-root agricultural technology service system. Improve regional, county-wide and township-wide agricultural technology promotion systems, improve working conditions, increase working fund, and maintain a stable team for agricultural technology promotion at grass-root levels. Encourage technological personnel to work at grass-root levels, strengthen linkage between research and promotion, and improve the ability to provide public services in agricultural technologies.

**(V) Development of the Agricultural Mechanization System**

1. Advance agricultural mechanization. Accelerate total mechanization of grain production, with focus on crucial processes of paddy, wheat and corn production; increase the availability of agricultural machinery. By 2020, raise the mechanization level for paddy transplanting and harvesting to 60 percent and 85 percent respectively, and that for corn sowing and harvesting to 75 percent and 50 percent respectively. Provide supports for mechanization cooperatives and large mechanized farmers. Accelerate mechanization for deep scarification and soil preparation, no-tillage sowing, mechanized corn harvesting, reuse of corn straws and deep application of chemical fertilizers; vigorously develop and set examples for protective cultivation. Accelerate spread of irrigation and drainage machines, drought relief machines and water-efficient irrigation equipments; increase effective irrigation rate and irrigate water utilization factor.
2. Subsidize purchase of agricultural machinery. Increase subsidy for farmers to buy advanced, suitable agricultural machinery, diversify forms of subsidies and heighten subsidy standards, improve subsidy procedures, increase availability of agricultural machinery, accelerate mechanization of grain production.

Table 5: Major Projects and Financial Supports for Agricultural Machinery
Agricultural mechanization advancement project: Support mechanization cooperatives and set county examples for agricultural mechanization; set a 10 million Mu example for protective cultivation in selected counties (or cities, districts or farms) in the Northeastern Region, Huang-Huai-Hai Region, Northwestern Region and Shanxi Province.
Subsidy for purchase of agricultural machinery: The central government will increase subsidies for farmers, farm workers and specialized farmer cooperatives in core zones to purchase power machines, tillage machines, planting machines, plant protection machines, harvesting machines, grain drying machines and irrigation and drainage machines.

**(VI) Development of the Disaster Prevention and Relief System**

1. Flood control and drought relief. Give a balanced consideration to flood control, drought relief and environment; further improve construction and management of flood control works, and increase the flood control capacity of rivers. Create the drought monitoring network as well as the drought forecast and relief water allocation system.

2. Prevention and control of major diseases and pests. Continue the plant protection project, establish forecast and control stations for agricultural pests, improve the reserve of emergency supplies, and create a monitoring, prevention and control system characterized by “an efficient operation, quick response, with complete functions and having strong control”. Enhance real-time allocation; advance joint prevention and control as well as uniform prevention and control; increase the ability to control and extinguish unexpected, epidemic, and migrating pests. Try to reduce the grain loss rate due to diseases and pests by 1-2 percent by 2020.
  
3. Meteorological services for prevention and control of disasters. Improve the agricultural weather monitoring network to boost prevention and control of disasters through meteorological services, with focus placed on core zones for grain productions and major grain production counties in secondary production areas. Strengthen disastrous weather forecast and assessment as well as crop disease and pest forecast; provide agricultural weather follow-up and technical consultation services; boost the prevention of meteorological disasters. Enhance the capacity and working system of artificial precipitation and hail suppression.

Table 6: Major Projects and Financial Supports for Disaster Prevention and Relief
<p>Flood control and drought relief projects: Harness major tributaries and lakes in the middle-to-lower reaches of the Yangtze River, including lower reaches of Hanjiang River, Dongting Lake, Poyang Lake and some small and medium sized rivers. Regulate main plains and low-lying areas along Huaihe River, construct flood control works in the Northeastern Region, and upgrade 18.53 million Mu of farmland prone to water logging. Provide emergency water supply for drought relief.</p> <p>Meteorological services for prevention and control of disasters: Improve weather monitoring and information release and transmission, agricultural weather forecast, agricultural weather alerting and prevention, artificial precipitation and hail suppression, with focus placed on core zones for grain production and major grain production counties in secondary production areas.</p> <p>Plant projection project: Establish and improve municipal or county-wide agricultural pest forecast and control stations in core zones for grain production and major grain production counties in secondary production areas, thereby fully enhancing the capability of monitoring, forecasting, preventing and controlling crop pests.</p> <p>Financial supports for prevention and control of crop diseases and pests: The central government will increase financial supports and improve subsidy procedures in stronger support of prevention and control of grasshoppers, wheat stripe rusts, paddy diseases and pests and others, and promote uniform prevention and control.</p>

**(VII) Development of the Agricultural Eco-environment Protection System**

1. Water resource protection and soil conservation. Strengthen protection and management of water resources, remain on the track of water conservation, and production expansion under the principle of aligning grain production to the bearing capacity of water resources; give an overall consideration to water

resource allocation, apply stringent total control and limit management of irrigation water, and reasonably determine the amount of agricultural irrigation water. Strengthen management of agricultural water demand, vigorously develop water-efficient farming, control increase in agricultural water consumption, and continuously increase efficiency and returns of agricultural water use. Strengthen efforts to construct measurement facilities for agricultural irrigation water; define additional prices for excess water use on a region-specific basis, among others, to promote agricultural water conservation. In the Huang-Huai-Hai Region, optimize the irrigation mode of combining wells and channels, reduce over-exploitation of groundwater, and prevent eco-environmental problems due to groundwater over-exploitation. In the northwestern inland river regions, develop dry and water-efficient farming, and control water-intensive crops and reduce irrigation acreage as appropriate in addition to strengthened water conservancy. In the Northeastern Region, reasonably exploit and properly preserve water resources, protectively utilize new irrigated farmland, and avoid new ecological problems. Construct water conservancy works in the upper reaches of rivers in accordance with planning and water allocation requirements, give an overall consideration to domestic, industrial and ecological water demand in upper and lower reaches, and pay special attention to protecting eco-environment in lower reaches. Enhance monitoring, prevention, and control of water pollution, control and reduce contamination of rivers and lakes, and improve the water quality and environment. Control soil erosion in the black soil region of northwest China, the Loess Plateau and the rocky desertification areas in southwest China.

2. Monitor and control agricultural non-point source pollution. Establish and improve the agricultural non-point source pollution monitoring and warning system, set up agricultural non-point source pollution monitoring stations at the county level in core zones for grain production, comprehensively carry out monitoring and warning of agricultural non-point source pollution, and maintain timely understanding of the status and trends of agricultural non-point source pollution, thereby providing a sound basis for preventing and controlling agricultural non-point source pollution. Based on the policy of source control, process interception and terminal treatment, accelerate reduction and replacement of chemical fertilizers, promote environment-friendly farming technologies, such as precision fertilization and pesticide application, to prevent and control agricultural non-point source pollution. Based on regional characteristics of agricultural non-point source pollution, carry out ecological interception projects for farmland with focus placed on the Yangtze River basin and due consideration to paddy production areas in the Northeast Region and the Huang-Huai-Hai Region; build constructed wetlands at stream intakes of rivers and lakes to intercept nitrogen and phosphorus from paddy fields.

3. Reuse of straws. Promote key technologies including mechanized straw reuse, straw mulching, quick decomposition and bio-reactors.

**Table 7: Major Projects for Agricultural Eco-environment Protection**

Farmland non-point source pollution control project: Build ecological interception works in core zones for grain production; set examples of constructed wetlands at intakes of rivers and lakes.

Comprehensive straw utilization project: Carry out the comprehensive straw utilization project in 680 counties (or cities, districts or farms) in core zones for grain production, with focus placed on straw ammoniation tanks, straw biomass gasification, pyrolysis, gasification and briquetting.

Agricultural Non-point source pollution monitoring system: Set up 160 agricultural non-point source pollution monitoring stations in core zones for grain production in line with regional climate, soil conditions and farming practices, thereby establishing and improving the agricultural non-point source pollution monitoring system.

### **(VIII) Development of Grain Storage, Logistics and Processing Capacity**

1. Expand grain storage capacity. Establish central and local grain reserves, primarily in the Northeast Region and secondarily in the Huang-Huai-Hai Region, the Yangtze River basin and the Western Region. Encourage farmers to store grain scientifically; support specialized cooperatives and farmers to construct grain storage facilities and buy new storage containers. Construct and improve drying and purification facilities, improve grain processing capacity, including drying.
2. Develop the grain logistics system. Accelerate upgrading of inter-provincial grain logistic channels in line with railway construction to form a convenient, efficient and economical modern grain logistics system. Focus upgrading on six major inter-provincial grain logistic channels for outflow of grain from the Northeast Region, wheat from the Huang-Huai-Hai Region and paddy from middle and lower reaches of the Yangtze River, and for grain inflow to south China, east China, Tianjin and Beijing. Support construction of large grain logistic nodes including seaports, river terminals and railway stations, improve facilities for bulk grain distribution, receiving, unloading, transport and auxiliary services. Expand storage capacity for grain collection and transfer in primary production areas, provide necessary vehicles for bulk grain transport, and achieve “Four Bulk’s” (bulk loading, bulk unloading, bulk storage and bulk shipment).
3. Develop grain processing. Vigorously develop the grain and oil, food processing industry, promote large-scale grain processing, and develop deep grain processing without compromise of grain security. Optimize feed industry structure to mitigate the use of feed grain.
4. Reduce post-production loss of grain. Improve grain harvesting, storage, transport and processing methods, promote advanced and suitable harvesting machinery, storage facilities, transport vehicles and processing equipments, increase quality and precision of machinery, and eventually reduce the post-production loss of grain.

Table 8: Major Projects for Development of Grain Storage and Logistics
<p>Storage and drying facilities: In 800 counties (or cities, districts or farms) in primary and secondary production areas, add, repair and upgrade storage facilities, with focus placed on expanding grain drying capacity of the Northeastern Region, to ensure timely and safety collection and storage of additional grain produced. Accelerate development of individual farmers' storage facilities.</p> <p>Grain logistics project: Build 10 billion kg of intermediary storage capacity at main logistic nodes along the six major inter-provincial grain distribution channels, add bulk grain receiving and release facilities and transport vehicles, create the grain logistics information platform and testing and inspection systems.</p>

## **VII. Economic and Social Benefits and Environmental Impact Assessment**

Implementation of the plan will create good economic and social benefits, and also have certain negative effects on environment.

### **(I) Analysis on Economic and Social Benefits**

#### **1. Economic Benefits**

When this Plan is completed, the grain production capacity will steadily increase by 50 billion kg from the three-year average in 2005-2007, gain markedly stronger resistance to risks, and fluctuate less between years. Estimate at the current average purchase price in the market, RMB85.2 billion of additional grain will be produced if the final objective is met. Given that value, the income increase per capita will reach RMB147 in 800 counties and RMB11 in other regions; the income increase per Mu will be RMB110 in 800 counties and RMB20 in other regions.

#### **2. Social Benefits**

When this Plan is completed, the national grain output will steadily reach 550 billion kg and the grain self-sufficiency rate will reach 95% or even higher, effects of international markets on domestic grain availability will be kept controllable, and micro-control capability will be enhanced, laying a sound foundation for national grain security, steady growth of national economy and social stability.

Part of rural surplus labor may be utilized in such projects as water conservancy, upgrade of low-to-medium-yield farmland, prime farmland development, fine strain development, soil fertility development, plant protection and agricultural mechanization, which will in turn increase farmers' income and drive development of related industries, such as agricultural researches, agricultural machinery manufacture, fertilizers, plastic membranes and pesticides.

This Plan will help improve farmland infrastructure in priority regions, markedly increase disaster resistance and basically avoid heavy reliance on weather conditions; broad use of modern agricultural

technologies and machinery will significantly improve production conditions, reduce labor intensity and, facilitate transfer of land, and ease farmers' heavy reliance on lands by engaging them in secondary and tertiary industries.

## **(II) Environmental Impact Assessment**

### **1. Impact of Land Resource Exploitation on Ecological Environment**

The land to be upgraded or exploited under this Plan may cause adverse effects on regional ecological environment, such as secondary soil salinization, if improperly exploited. Therefore, the land exploitation modes, sequence and scale must be reasonably planned; thorough researches and in-depth analyses must be done before exploitation on local water and soil conditions as well as ecological environment characteristics to develop detailed plan for prevention of ecological risks.

### **2. Impact of Water Resource Exploitation on Ecological Environment**

Water resource exploitation will have the following effects on ecological effects: Expanding water sources and irrigated area in water-stressed regions may affect availability of ecologic water, part of irrigated areas and drainage effluents may undermine water quality of rivers; water conservancy projects and land exploitation may adversely affect wetlands. Therefore, water resource researches must be conducted to reasonably control water exploitation, coordinate water for domestic, industrial and ecological purposes, ensure availability of basic ecological water for rivers and safeguard the health of rivers; overall balance of water resources should be conducted on regional water supply to determine reasonable quotas for irrigation and avoid adverse effects on regional biological environment; the production expansion objective should be lowered where severe water shortage occurs; existing wetlands should be protected to prohibit cultivation or otherwise utilize natural wetlands without approval.

### **3. Impact of Increased Agricultural Supplies on Environment**

#### **(1) Chemical Fertilizers**

Excessive use of chemical fertilizers and low fertilizer efficiency will lead to non-point source pollution. Prolonged application of chemical fertilizers alone, in particular physiologically acid fertilizers, will cause acidification and compaction of soils; nitrogenous and phosphoric fertilizers may enter groundwater or surface streams through eluviations, runoffs and farmland effluents to eutrophicate water bodies. Therefore, formula fertilization by soil testing should be adopted to effectively reduce use and raise efficiency of chemical fertilizers; increase the density of soil testing, scientifically develop fertilization formula specific to crops and growth stages, take reasonable agronomic measures and introduce deep application reasonably, and divert farmers from conventional fertilization practices.

#### **(2) Pesticides**

Excessive insecticides and herbicides will suppress or even kill soil microorganisms, affect activity of

enzymes and conversion of nutritive substances, change nutrient circulation efficiency in the agricultural ecosystem, and reduce sustainable productivity of land; pesticides attached to plants or soils will enter surface streams or aquifers through eluviations, seepage, runoffs and effluents to seriously compromise the quality of surface water and groundwater. Therefore, modern biotechnologies should be used to develop high-resistant or transgenic species, increase crops' resistance to diseases and pests, and reduce frequency and amount of pesticide application; less pesticides and herbicides should be applied through forecast, warning, uniform prevention and control and precision application; bio-pesticide or bio-herbicides should be developed to encourage use of natural enemies such as oophagous trichogrammae and mitigate environmental effects of pesticides and herbicides.

### (3) Plastic Membranes

Residual plastic membranes will damage the soil structure of the cultivated horizon, lower ventilation and water permeability of soils, suppress activity of microorganisms and soil fauna and eventually compromise soil fertility; they will also suppress germination, seedling emergence and root growth of crops and cause yield reduction. Therefore, residual plastic membranes should be further recovered to minimize adverse effects on environment.

### 4. Crop Straws

Direct burning of straws will result in emission of organic carbon to air. Centralized incineration during crop harvesting will severely affect air quality or even aviation safety. In addition, waste straws immersed in water bodies will intensify non-point source pollution.

Therefore, straw reuse acreage should be increased gradually and the comprehensive straw utilization ability should be improved to reduce adverse effects on environment through developing straw-derived plates and biomass energy and other measures.

## **VIII. Creating a Sustainable Mechanism for Steady Development of Grain Production**

As the ongoing global financial crisis poses a rising impact on China's agriculture and the country suffers sharper contradiction between expanding population and shrinking farmland, cementing the base of grain production and fulfilling the objectives set in this Plan are challenged by many difficulties. Therefore, we should attach importance to advancing and innovating in agricultural technologies to boost technological supports; give more weight to developing agricultural infrastructure and improving grain production conditions; give more weight to implementing the provincial governors' grain responsibility system and clarifying governments' responsibility for grain security at all levels; give more weight to improving policies on supporting grain production to increase farmers' willingness to grow grain, give more weight to macro-control of grain markets to seamlessly connect production and marketing; and give more weight to creating a sustainable mechanism to promote steady development of grain production.

**(I) Implement the provincial governors' grain responsibility system, clarify central and local governments' responsibilities for grain security**

Local governments at all levels should, under central arrangements of the CPC Central Committee and the State Council, further improve ideological understanding, give top priority to grain production in modern agriculture development, make relentless efforts to stabilize existing production capacity and tap into the potential for production expansion, and ultimately meet the objectives of production expansion. Central and local governments' responsibilities for grain security should be clarified; the central government should be responsible for overall balance of grain demand and supply, centrally managing grain import and export, establishing and improving central grain reserves, regulating grain markets and prices nationwide, protecting national farmland and water resources, and supporting local grain production by linking subsidies to grain output; provincial governments should fully implement the provincial governors' grain responsibility system to clarify and assign grain development objectives, enhance supporting policies, properly administrate grain production and assign reserve tasks; primary grain production areas should ensure stable supply of commodity grain to the entire country; secondary production areas should pay due attention to local grain production, prevent and correct the tendency of relaxing grain production and shuffling through grain production expansion, fulfill their responsibility for protecting local farmland and water resources, producing and marketing grain as well as regulating the markets, increase local government spending in agricultural infrastructure and cement and increase grain production, thereby ensuring non-shrinkage of local farmland acreage and grain growing area and non-decline in grain self-sufficiency.

Accelerate exploration of interest linkage between primary production areas and primary distribution areas. Give more weight to primary production areas when developing supporting policies for grain production, increase supports for grain production development projects in major grain production counties, and create a system of compensation to primary production areas from primary distribution areas, in particular developed regions. Improve the grain risk fund policy and phase out primary production areas' contributions to the fund. Involve primary distribution areas in construction of production bases and storage facilities of primary production areas to shape a solid collaboration mechanism between production and marketing.

Establish an efficient grain security monitoring, inspection and performance assessment mechanism. Break down objectives to each level in respect of protecting arable land and prime farmland, stabilizing grain growing acreage and maintaining local reserves, and incorporate them as a crucial element into the performance assessment on local governments, in particular their leadership.



## **(II) Stick to the household contract system, steadily advance large-scale land operation.**

Stabilize and improve the fundamental rural operation system. Stick to the double-tiered operation system combining centralization and decentralization based on household contract operation. Upgrade household operation to advanced technologies and production practices; expand investment in technology and capital input, and increase the level of intensive operation. Where conditions permit, foster specialized large farmers, household farms, farmer cooperatives and other large-scale operators, promote large-scale planting and operation, increase economics of scale in grain production and follow the way of modern grain industrialization.

Enhance management of and related services for transferring land contract operation rights. Improve the components of land contract operation rights to safeguard farmers' rights in occupying, using and gaining yields from the land contracted. Improve the market for transferring rural land contract operation rights, permit farmers to transfer said rights by sub-contract, lease, exchange, assignment and joint-stock on a lawful, freewill and paid basis, and diversify appropriate large-scale operation modes. Improve the transfer approval, notarization and registration system, remove related charges, and centralize farmland to large and skilled grain growers.

Foster new farmer cooperatives.

Accelerate development of specialized cooperatives of grain growers to enhance collaboration of farmers, foster and support private service organizations for grain production, strengthen technical services for agricultural supplies distribution, mechanization, professional plant protection and other grain production processes, and create diverse, multi-tiered and multi-form operation and service systems. Increase incentives and supports for large grain growers, large mechanized farmers, specialized farmer cooperatives and specialized service operations, accelerate large-scale planting and operation, reduce labor intensity and production cost, and increase economics of scale in grain production. Promote standard and high-quality grain production through specialized services, drive specialization and commercialization of grain production, address new problems in grain production and marketing emerging from migration of rural young and middle-aged labor force, and thus avoid discontinued production or extensive operation.

## **(III) Strictly protect farmland resources, stabilize grain growing acreage**

Protect farmland to the most stringent standards. Fulfill provincial governments' objectives for farmland protection, and keep a minimum total farmland area of 1.8 billion Mu. Strengthen protection of prime farmland, identify and permanently retain grain production areas with good conditions and high productivity, in particular State-funded high-and-stable-yield farmland; identify persons responsible for

farmland protection, prohibit acquiring and altering purposes of farmland without approval, and ensure that prime farmland will not shrink in size or change in purposes and improve in quality. Prohibit excavating fish ponds or growing trees in cropland. In core zones for grain production and major grain production counties in secondary primary production areas, identify prime farmland at the plot and household levels and indicate it on the certificate of rights to land contract operation. Enhance management of land use planning, conserve land to the most stringent standards, and strictly control the total size of land for urban and rural construction. Vacant land from rural house sites and village rearrangement should be first rehabilitated for farming. Improve the land acquisition and displacement system, and restructure the spending of proceeds from land transfer by gradually spending more on agricultural land development and rural infrastructure. Strictly balance acquisition and cultivation of land, cultivate before acquisition; prohibit inter-provincial (or equivalent) balancing; avoid acquiring fertile farmland but cultivating barren land; prohibit acquiring paddy fields but cultivating dry land.

Strengthen protection of reserve farmland resources. Align grain production development to ecological environment. Learn lessons from the past rush for wasteland cultivation at the cost of ecology; do not hastily cultivate woodland, grassland and wetland for farming. In particular in ecologically fragile regions, such as west Jilin Province, prohibit further cultivation of wasteland, grassland or wetland without approval.

Improve the monitoring and punishment mechanism for farmland protection. Improve the national land supervision system, include protection of farmland, in particular prime farmland, as a veto factor in local government assessment, and stop any land-related violations and non-compliances. Strengthen public supervision by fully disclosing the quantity, acquisition, compensation and cultivation of farmland and strictly implementing the land acquisition hearing and announcement system.

Stabilize grain growing acreage. Give a balanced consideration to food and industrial crops to assure stable grain growing acreage; keep 1.58 billion Mu of grain production area nationwide by 2020, including 1.26 billion Mu for cereals. Continue to optimize the mix of grain varieties; vigorously develop high-quality dedicated wheat, high-quality paddy, high-quality dedicated corn, high-oil-and-protein soybean in line with market needs and natural resource conditions, thereby improving returns on grain production. Accelerate spread of fine species as well as advanced and feasible technologies, scientifically apply pesticides and chemical fertilizers, promote regionalized and standardized planting, and continuously improve grain quality.

#### **(IV) Accelerate innovation in agricultural technologies, improve technological accessibility**

Boost researches on fundamental agricultural application technologies. Integrate research resources to

create a fundamental and engineering research platform, break technological bottlenecks, and facilitate commercialized development and application. Accelerate creation of the agricultural research system that combines farming, research and education as well as integrates enterprises, universities and research institutions to promote innovation in agricultural technologies. Advance the diverse and multi-channel agricultural research financing mechanism led by the government, significantly increase grain research funding, support fundamental and cutting-edge researches related to grain, and promote demonstration and application of high-tech achievements in the agricultural community.

Increase the technical conformity rate of grain production. Create and improve the agricultural technology promotion system in which the responsibility for promotion rests primarily with agricultural technology promotion agencies at the county, prefecture and province levels, and secondarily with research institutions, universities, enterprises and private agricultural service organizations. Reform technology promotion agencies at grassroots levels to set and staff work positions to the extent necessary. Improve the expertise structure of agricultural technology promotion personnel by engaging graduates from colleges and secondary technical schools in agricultural technology promotion. Carry out the high-yield grain production campaign and the technology penetration program; integrate and promote advanced, feasible technologies. Guide and encourage agriculture-related businesses and specialized farmer cooperatives to innovate in and promote grain technologies and provide technological services for farmers. Improve the farmer technology training system, encourage farmers to learn and apply advanced technologies and heighten farmers' skills in scientific farming.

Accelerate development of chemical fertilizers, pesticides, agricultural machinery and other agricultural industries to ensure supplies for grain production. Given excessive production of nitrogenous and phosphatic fertilizers and severe shortage of potassic fertilizers in China, optimize the structure of nitrogenous fertilizer manufacturers, build large nitrogenous fertilizer production bases; develop potassic fertilizer resources to expand production, and accelerate development of compound fertilizers, slow-released fertilizers and bio-fertilizers. Control pesticide production under stringent access standards, accelerate research and development of bio-pesticides and pesticide machines, strengthen management of product quality, and encourage development of pesticide with high efficiency, low toxicity and low residual, and promote biotechnologies for prevention and control. Strengthen research and development of agricultural machinery, accelerate introduction, absorption and digestion of advanced technologies, boost commercialization of research findings concerning agricultural machinery, accelerate research, development, and manufacture of multi-purpose, energy-efficient and environment-friendly agricultural machinery, improve agricultural machinery testing and assessment approaches, and ensure the safety of agricultural machinery.

#### **(V) Expand investment in infrastructure, improve construction and management mechanism**

Increase investment in grain production. Under the principles of adjusting existing ones and inclining additional ones, adjust allocation of national income to give more weight to agriculture, in particular to grain production. Optimize the mix of government funding, fixed asset investment and credit extension. Local governments at all levels should significantly increase investment in agriculture, and allocate to agriculture a much bigger portion of proceeds from land transfer and farmland acquisition tax; additional proceeds from increase in farmland acquisition tax rate should be earmarked for agriculture in full; diversify funding sources for grain production and make available funds as planned.

Integrate grain production capacity funds. For existing fixed asset investments, comprehensive agricultural development funds as well as land exploitation and consolidation funds, focus money on core zones for grain production and major grain production counties in secondary production areas to create a composite force, boost supports, enhance investment supervision and increase the funding efficiency.

Improve funding mechanism. Create and improve a diversified funding mechanism, with public finance being the primary source of funding. Implement relevant preferential fiscal and taxation policies, and attract private capital to grain production. Focus government investment on farmland and water conservancy, prevention and control of diseases and pests, soil fertility monitoring and other infrastructure. Innovate in investment mechanism, substitute rewards with subsidies, encourage and support wide construction of small farmland and water conservancy facilities and dry farming works.

Strengthen management and protection of agricultural infrastructure. Innovate in the ownership management mechanism for rural small-sized infrastructure, clarify the ownership of related infrastructure, assign ownership to farmers as much as possible, and allow transfer of operation rights through contracting and leasing, thereby encourage farmers to manage and protect grain production infrastructure and ensure sustained returns on agricultural investment. The government at the corresponding level should provide necessary financial supports for large- and medium-sized non-profit grain production infrastructures that require high operation and management costs and provide far-reaching benefits.

#### **(VI) Increase financial subsidies, improve reward and subsidy policies.**

Increase supports and protection for grain production. Increase subsidies, improve subsidy methods, expand coverage and raise standards to fully encourage farmers to grow grain. Improve the policy on direct subsidy for grain production, and increase grain production subsidy for farmers over years; based on the existing fine strain subsidies for cereal crops, increase the subsidy money as appropriate, gradually expand subsidy coverage, and continuously raise the fine strain coverage of cereal crops. Increase subsidy for purchase of suitable agricultural machinery, and adjust machine types eligible for subsidy at appropriate

time; improve the dynamic adjustment mechanism for the comprehensive agricultural supplies subsidies that is linked to prices of agricultural supplies. Gradually increase the subsidies for grain production technologies.

Increase rewards for major county production counties from the state revenue. Create and establish the interest compensation system for major grain production counties, improve procedures for linkage between reward money and grain output and outflow amount, thereby promoting growth of both grain production and government revenue. Increase general transfer payments and rewards for major grain production counties in line with these counties' contribution to national grain security, with more weight given to core zones for grain production, to increase grain output, farmers' income and government revenue, thereby avoiding major grain production counties with shameful government revenue and increasing local governments' enthusiasm for grain production expansion.

Increase financial supports for grain production. Strengthen combination of government funding and credit financing; fully exert the guiding and driving roles of government funding, and expand credit financing for grain production. Improve the rural finance system, diversify financing sources, and guide more credit money to grain production. Increase policy-based finance's long- and medium-term credit supports for grain production infrastructure, and expand lending to grain production from commercial and cooperative finance. Develop microloans, encourage micro-financial services suitable for grain production, offer interest discounts for lending to large grain growers, large mechanized farmers and specialized cooperatives of grain growers, and increase financial supports for grain production. Provide tax incentives for financial institutions that issue loans for grain production and agriculture.

Create the grain credit risk mitigation mechanism. Establish a market-driven rural credit security mechanism supported by the government and involving multiple sides. Continuously innovate in the modes of grain credit security, expand the scope of rural collaterals, develop co-guaranteed lending and explore pledge by moveables and production orders and other security modes, thereby effectively addressing limited collaterals for farmers to secure loans. Accelerate policy-based agricultural insurances, improve the grain insurance mechanism, steadily expand the insurance scale and pilot scope, and establish grain reinsurance and catastrophic risk spreading mechanism.

#### **(VII) Deepen reform in the grain distribution system, improve grain distribution system**

Continue to deepen reform in the grain distribution system. Boost development of the modern grain distribution industry, increase competitiveness of grain market players. Continue to deepen reform in state-owned grain enterprises, drive merger and reorganization of state-owned grain enterprises, support major state-owned enterprises engaging in grain purchase, storage and processing, improve their marketing capability, and continue to play their role as primary channel in grain purchase. Encourage and guide

leading enterprises that engage in grain purchase, marketing and processing to “make to order”, and promote grain industrialization. Support specialized farmer cooperatives and farmer brokers to provide farmers with services for grain production and marketing, and cause farmers to produce and market grain in a better-organized way.

Improve the grain market system. Give priority to creating and developing regional, specialized wholesale markets for bulk grain commodities as well as wholesale markets for finished cereal and oil products in large and medium cities, develop centralized grain distribution and E-commerce, and develop the urban cereal and oil supply network and the rural cereal trade market. Steadily develop grain futures trading, guide grain enterprises and specialized farmer cooperatives to hedge risks in the futures market. Create the national public information platform for grain logistics to promote electronic grain trading.

#### **(VIII) Strengthen macro-control of grain markets, safeguard national grain security**

Improve the grain statistics monitoring system. Continue to strengthen statistical survey on grain production, reform grain output survey methods, improve survey approaches, reduce human interference and provide scientific basis for making decisions on grain macro-control. Enhance monitoring over grain production, consumption, import, export, storage, shipment and quality, accelerate creation of early-warning and monitoring system and the market information consultation mechanism. Advance grain IT development, establish and improve the databases for grain production, consumption, import, export, storage and shipment, collect and understand dynamic information on a timely and accurate basis, and increase the accuracy and timeliness of data.

Improve the minimum grain purchase price policy. Gradually raise the minimum purchase price of grain in line with production cost and demand-supply relationship, keep grain prices at a reasonable level, safeguard reasonable returns from grain production and thus spur farmers to grow grain. Explore and create a counter-cyclical subsidy system centered on the target price, fully exert the role of market.

Strengthen regulation of import, export, storage and processing of grain. Boost regulation of grain import and output to reasonably leverage international markets. Improve the grain reserve control system, optimize reserve allocation and mix of grain varieties, and improve the reserve grain rotation mechanism. Further improve the grain market access system, develop industry policies on domestic purchase, marketing, storage, shipment and processing of cereals and oils, and improve relevant administration procedures as soon as possible. Boost construction and maintenance of facilities for grain processing, supply, storage and shipment in large and medium cities and other important areas nationwide; local governments should provide necessary supports for grain processors and sellers included into the emergency response network.

Advocate scientific, economical use of grain. Strengthen education and publicity, guide scientific diet and healthful consumption, and foster a good trend of cherishing grain and opposing waste.

#### **(IX) Guide grain production and consumption to balance grain varieties**

Adjust the planting structure to mitigate contradiction between demand and supply of grain varieties. Moderately reduce wheat acreage in the Northwest Region, stabilize paddy acreage in the Northeastern Region, expand interplanting acreage in the Southwestern Region, and increase corn acreage. Strengthen regulation of grain price, adjust the mix of grain varieties by leveraging prices, and reasonably determine price relations between grain varieties to release wheat and paddy production capacity as appropriate.

Guide the public to adjust diet structure, advocate the wheat staple culture with Chinese characteristics, promote knowledge on nutrition of traditional Chinese wheat foods, and increase consumption of wheat and flour products. As the majority of wheat species produced in China are suitable for steamed and boiled flour products, the previous plan for developing the wheat industry through making bread and Western-style cakes alone should be shifted to industrialization, modernization and commercialization of staple foods including steamed and boiled flour products. Develop the wheat and paddy food processing industry and increase the processing capability in accordance with requirements on “safety, quality, nutrition and convenience”. Pay due attention to innovation in industrial technologies on conventional staple foods, strengthen fundamental researches on wheat, flour and related foods, commercialize research findings, independently develop equipment complex as well as crucial instruments for quality testing, improve the quality standards for wheat and flour products, develop a series of brands and fully upgrade and improve the flour processing industry.

Further develop additional purposes of wheat, and encourage development of wheat-based feed processing with assured supply for food demand. Regulate grain processing, appropriately control the scale of deep corn processing.

#### **IX. Implementation of this Plan**

Relevant authorities and local governments at all levels should reach a common understanding of and pay due attention to grain security issues, strengthen guidance and coordination, properly arrange for implementation, enhance supervision and inspection, and ensure fulfillment of the objective for expansion of grain production capacity.

##### **(I) Strengthen guidance and coordination.**

Relevant authorities should cooperate closely to strengthen guidance and cooperation within their duties and boost supports. The State Development and Reform Commission should be responsible for overall

coordination, including approving the implementing plans of provinces (or regions or municipalities) in conjunction with related departments, and make available the central infrastructure investment and annual funding arrangements set forth in this Plan; the Ministry of Agriculture should be responsible for guiding grain production, technical services and related projects, and ensuring stable grain growing acreage; the Ministry of Water Resources should be responsible for directing water conservancy projects, reasonably allocating water resources and ensure availability of water for grain production; the Ministry of Land Resources should be responsible for protecting and managing farmland, and fulfilling the mission of land consolidation and rehabilitation; the Ministry of Science and Technology should be responsible for technological input in grain production and accelerating technological advancement and innovation; the People's Bank of China and China Banking Regulatory Commission should be responsible for developing and implementing policies on financial supports for grain production; the Ministry of Environmental Protection should be responsible for coordinating monitoring and protection of agricultural eco-environment. Relevant authorities should focus existing funding on core zones for grain production and major grain production counties in secondary production areas as required by this Plan. The State Development and Reform Commission should lead to establish the inter-departmental consultation system to ensure seamless linkage between arrangements of different departments.

## **(II) Properly arrange for implementation.**

Provinces (or regions or municipalities) taking responsibilities under this Plan should strengthen leadership and break down responsibilities to relevant departments or establish an implementation leadership team led by the government official in charge and participated by relevant departments including development and reform, finance, water resources, agriculture, land resources as well as science and technology, thereby coordinating specific work in implementing this Plan; develop local implementation plans in line with tasks set in this Plan, establish the objective responsibility system, break down tasks to counties, and clarify the responsibilities of county governments and relevant policies. Core zones for grain production and major grain production counties in secondary production areas should make specific implementation plans to break down objectives and tasks to towns and villages. Other provinces (or regions or municipalities) should continue to enhance the responsibility for grain security, properly manage grain production and ensure that local grain growing acreage will not shrink and grain self-sufficiency rate will not decline. For widespread projects with limited subsidies, with tasks, standards and arrangements clarified, local governments should be fully encouraged to implement specific projects and assume corresponding responsibilities under the principles of consistent rights and responsibilities. For projects that directly benefit farmers, such as farmland and water conservancy, local government should guide farmers to involve themselves in these projects.



### **(III) Strengthen supervision and inspection.**

Take the results of tasks set under this Plan as a crucial basis for arrangement of related investments and policy supports as well as performance assessment on local governmental departments. The State Development and Reform Commission should, in conjunction with relevant authorities, conduct supervision and inspection over related proveniences (or regions or municipalities), in particular those assuming major tasks under this Plan. Relevant authorities should also strengthen inspection within their duties and urge local governments to fully implement this Plan. At the end of each year, relevant authorities and provinces (or regions or municipalities) shall summarize implementation of this Plan and present to summary report to the State Development and Reform Commission, which in turn will report the overall performance to the State Council. Conduct phased assessment and environmental impact assessment on implementation of this Plan. The State Development and Reform Commission should assess provinces (or regions or municipalities) every five years and improve this Plan promptly according to assessment results. Local governmental departments at all levels should fulfill their responsibilities under this Plan to strengthen implementation, supervision and administration of tasks within their jurisdiction and ensure successful completion of tasks under this Plan.

[1] The existing grain production capacity is about 500 billion kg, compared with the three-year average of 495 billion kg in 2005-2007, 501.6 billion in 2007, and 528.55 in 2008.

[2] Northern regions include Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shandong, Henan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang, 16 provinces (or autonomous regions or municipalities directly under the Central Government) in total; Southern regions include Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Hubei, Hunan, Guangdong, Guangxi, Henan, Sichuan, Chongqing, Guizhou and Yunnan, 15 provinces (or autonomous regions or municipalities directly under the Central Government) in total.

[3] Primary production areas include: Heilongjiang, Liaoning, Jilin, Inner Mongolia, Hebei, Jiangsu, Anhui, Jiangxi, Shandong, Henan, Hubei, Hunan and Sichuan, 13 provinces (or autonomous regions) in total; balance areas include Shanxi, Guangxi, Chongqing, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang, 11 provinces (or autonomous regions or municipalities directly under the Central Government) in total; main distribution areas include Beijing, Tianjin, Shanghai, Zhejiang, Fujian, Guangdong and Hainan, 7 provinces (or municipalities directly under the Central Government) in total.

[4] Irrigation water utilization factor: Ratio of water delivered to farmland and utilizable by crops to the total water taken in by the irrigation system.